REMARKS/ARGUMENTS

Claims 1-9, 27 and 28 are pending herein. Claim 1 has been amended as support by, for example, Fig. 1 of the present application. New claim 28 is added hereby as supported by, for example, Fig. 1 of the present application.

1. Claim 27 was rejected under §112, first paragraph. This rejection is respectfully traversed.

The Manual of Patent Examining Procedure (MPEP) makes clear that a claim term, in a newly added or amended claim, that is not expressly stated in the specification does not *per se* introduce new matter into the application. That is, there is no requirement to provide a literal description (i.e., using the same terms or *in haec verba*) in order for the disclosure to satisfy the written description requirement. Accordingly, newly added claim limitations can be supported in the specification through express, implicit or inherent disclosure in the specification (see MPEP 2163 (I)(B)).

The following discussion demonstrates that the recitation in pending claim 27 that "said cooling mechanism directly cools only said oxide single crystal" is implicitly supported in the original written disclosure. Fig. 2b of the present application, for example, illustrates that a cooling tube 14B includes blowing holes 14b through which cooling medium 16 is directed toward oxide single crystal 31. The specification expressly states that "blowing holes 14b are formed in the cooling tube 14B to be faced with the ***oxide single crystal*** 31 so that the cooling medium in the tube is blown out through the blowing holes 14b toward the ***oxide single crystal*** 31 as arrows A indicate" (see specification, page 8, paragraph [0030])(emphasis added).

It is clear that a person skilled in the art would recognize that the above-quoted written description of the invention provides support for pending claim 27. Indeed, the arrows A shown in Fig. 2b of the present application show that ***cooling medium 16 is directed only toward the oxide single crystal 31*** (i.e., the blowing direction is perpendicular to the grown oxide single crystal 31). The PTO is reminded that the drawings in an application can support newly added claim limitations. That is, even though the original specification "does not positively recite other cooling of other portions of the crystal does not occur" as stated on page 2 of the Office Action, skilled artisans would understand that

Fig. 2b, after only a cursory reading and evaluation of the content of the application, supports the limitation that "said cooling mechanism directly cools only said oxide single crystal." The §112, first paragraph rejection should be withdrawn for this reason alone.

Moreover, the MPEP further provides that "the Examiner has the initial burden, after a thorough reading and evaluation of the content of the application, of *presenting evidence or reasons why a person skilled in the art would not recognize that the written description of the invention provides support for the claims*" (see MPEP 2163 (II)(A)(emphasis added). As discussed above, the PTO's position appears to be that the original specification "merely states cooling the oxide single crystal and *does not positively recite* other cooling of other portions of the crystal does not occur" (see Office Action, page 2, paragraph 2)(emphasis added). This reasoning in the Office Action, however, is erroneous because, again, as discussed above, under current U.S. practice and procedure, there is no requirement to positively recite in the specification a newly added claim limitation in order for the overall written disclosure to satisfy the written description requirement. The PTO cannot discharge its initial burden of presenting evidence that ***skilled artisans would not recognize that the written description supports the newly added claim limitation*** by requiring that the specification "positively recite other cooling of other portions of the crystal does not occur," as appears to be the PTO's position on page 2 of the Office Action. Again, Applicants respectfully submit that skilled artisans ***would recognize***, after reading and evaluating the content of the application, that the claim limitation "said cooling mechanism directly cools only said oxide single crystal" is supported in the original specification.

In view of all of the foregoing, reconsideration and withdrawal of the rejection of claim 27 under §112, first paragraph are respectfully requested.

2. Claim 1-9 were rejected under §103(a) over Imaeda et al. in view of Ciszek et al. To the extent that this rejection might be applied against the amended claims, it is respectfully traversed.

With reference to Fig. 1 of the present application, for example, pending independent claim 1 recites that an oxide single crystal is grown from a raw material melt that is drawn through an opening of crucible 7. A cooling mechanism 14 directly cools the oxide single crystal while the crystal is being drawn from the opening of the crucible. Pending claim 1

has been amended to clarify that, in addition to the cooling mechanism, a first heater 4 is provided around the opening of the crucible and a second heater 15 is provided around the oxide single crystal downstream from the cooling mechanism. Pending claim 1 has been further amended to clarify that the cooling mechanism and the second heater are arranged to be substantially co-linear with respect to one another along the direction in which the oxide single crystal is drawn from the crucible opening.

Fig. 3 of the present application (as discussed in Example 1) illustrates the benefits attributable to the claimed arrangement of the first and second heaters and cooling mechanism. Fig. 3 shows that if a cooling mechanism is provided around the opening of the crucible and a second heater is provided around the oxide single crystal downstream from the cooling mechanism, a sufficiently large temperature gradient is generated in a region immediately below the crucible opening. For example, the temperature of the oxide single crystal can be sharply decreased to a desired temperature (around 750°C) at a desired distance from the crucible opening (e.g., around 2.5 mm). Applicants discovered that this sharp transition of the oxide single crystal temperature down to the annealing temperature provides oxide single crystals of good quality, while substantially suppressing the formation of cracks in the grown crystals (see specification, page 5, paragraphs [0016]-[0019]).

Fig. 9 of Imaeda shows that an after heater 28 surrounds the lower portion of nozzle 29. Imaeda does not disclose or suggest the use of a cooling mechanism, let alone that (in addition to the cooling mechanism) a first heater is provided around the opening of the crucible and a second heater is provided around the oxide single crystal downstream from the cooling mechanism, as now recited in pending claim 1. One would have to redesign Imaeda's apparatus completely to include a direct cooling mechanism near the end of Imaeda's nozzle tip in the proximity of area (D) shown in Fig. 9 of Imaeda. That is, in order to obtain the structure now recited in pending claim 1, one would have to remove heater 28 and re-position that heater in a portion of the annealing region below area (D). Applicants can find no disclosure in Imaeda that would motivate one skilled in the art to redesign Imaeda's apparatus for the purpose of adding a cooling mechanism, especially since the Imaeda patent does not recognize that any benefits would be obtained by such a modification, let alone the above-discussed sharp temperature transition benefits attributable to the claimed structure.

Moreover, a corollary to the above discussion is that the Imaeda patent provides no disclosure that would enable one to make and use a structure including the claimed arrangement of the first and second heaters and cooling mechanism. The mere fact that Ciszek teaches that it is known to provide a cooling means at a freezing interface does not change the fact that it is clear from the specification and drawings in Imaeda that heater 28 is provided surrounding the opening of the crucible. As such, there is no enabling disclosure to be found anywhere in Imaeda with respect to how one would actually modify Imaeda to include Ciszek's direct cooling means, as alleged in the Office Action.

In view of all the foregoing, reconsideration and withdrawal of the §103(a) rejection over Imaeda in view of Ciszek et al. are respectfully requested.

3. Claims 1-9 and 27 were rejected under §103(a) over Mimura et al. in view of Shudo et al. To the extent that this rejection might be applied against amended claim 1, it is respectfully traversed.

Fig. 1 of Mimura shows a device that includes a crucible 2, into which a raw material 9 is supplied, having capillary tube and nozzle parts 7 and 8, respectively, extending from a bottom portion thereof. While heater 11 is used to melt the raw material in the bottom portion of crucible 2, heater 12 controls the temperature of nozzle part 8.

Fig. 1(a) of Shudo shows cooling means 9 used to cool the upper surfaces of crystal ribbon 1 and melt material 2.

The PTO acknowledges that Mimura does not disclose a cooling mechanism for directly cooling grown crystal portion 5 shown in Fig. 1 of Mimura. The PTO alleges that it would have been obvious to modify Mimura to include Shudo's cooling mechanism. As discussed above, pending claim 1 has been amended to clarify that the claimed cooling mechanism and second heater are arranged to be substantially co-linear with respect to one another along the direction in which the oxide single crystal is drawn from the crucible opening. Fig. 1a of Shudo clearly shows that cooling means 9 and heating means 19 are not substantially co-linear with one another, as claimed. Therefore, even if Mimura and Shudo were combined as asserted in the Office Action, there would still be no disclosure or suggestion of aligning the cooling mechanism and the second heater to be "substantially co-linear with respect to one another", as is recited in pending independent claim 1.

In view of all of the foregoing, reconsideration and withdrawal of the §103(a) rejection over Mimura et al. in view of Shudo et al. are respectfully requested.

4. Claims 1-9 and 27 were rejected under §103(a) over Imaeda et al. in view of Shudo et al. To the extent that this rejection might be applied against the amended claims, it is respectfully traversed.

The PTO acknowledges that Imaeda does not disclose a cooling mechanism, but is arguing that one would have found it obvious to modify Imaeda to include Shudo's cooling mechanism. The arguments discussed above with respect to the §103(a) rejection over Imaeda in view of Ciszek, and the §103(a) rejection over Mimura in view of Shudo apply equally to this rejection. In particular, one would have to redesign Imaeda's apparatus completely to include a direct cooling mechanism near the end of Imaeda's nozzle tip in the proximity of area (D) shown in Fig. 9 of Imaeda. Furthermore, even if Imaeda's apparatus was modified in such a manner and Imaeda and Shudo were combined as asserted in the Office Action, there would still be no disclosure or suggestion of aligning the cooling mechanism and the second heater to be "substantially co-linear with respect to one another" (as claimed) because Fig. 1a of Shudo clearly shows cooling means 9 and heating means 19 are not substantially linearly aligned with one another.

In view of all the foregoing, reconsideration and withdrawal the §103(a) rejection over Imaeda in view of Shudo are respectfully requested.

5. Claims 1-9 were rejected under the judicially created doctrine of obviousness-type double patenting over claims 1, 13, 22 and 26 of U.S. Patent No. 6,565,654 in view of Shudo et al. The PTO is requested to hold this rejection in abeyance until the above-discussed art-based rejections of record have been overcome, at which time Applicants will consider filing a Terminal Disclaimer to overcome this rejection.

If the Examiner believes that contact with Applicants' attorney would be advantageous toward the disposition of this case, the Examiner is herein requested to call Applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

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Date

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